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TREE PLANTING NEEDED IN TEXAS

BY

J. H. FOSTER
STATE FORESTER

AND

HARRY B. KRAUSZ
FORESTRY ASSISTANT

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PALMS FLOURISH IN THE PARKS AND GROUNDS ALONG THE GULF COAST.

BEAUTIFULLY PLANTED AVENUE IN A NEW RESIDENCE SECTION OF DALLAS

PREFACE

TREES.

Trees are the arms of Mother Earth lifted up in worship of her Maker. Where they are, beauty dwells; where they are not, the land is ugly, though it be rich, for its richness is but greasy fatness and its gaudy raiment is but cheap imitation of forest finery.

Trees are the shelter of man, beast and bird; they furnish the roof above us, the shade about us and the nesting places of love and song. They call children out to play; they entice sweethearts into leafy coverts to seal their vows with fond caresses; they console and gratefully reward old age. They are the fittest ornaments of wealth and the inalienable possessions of the poor who can enjoy them without having title to them. They are the masts that fly the flags of all nations and the sails of all seas; they are the timbers that bridge forbidding streams; they bear the wires of the world's intelligence; they hold the rails that carry the traffic of the continents; they are the carved and polished furnishings of the home; they cradle the young and coffin the dead.

Trees are nature's prime sources of food; their fruits and nuts gave sustenance to the first tribes of men and are the sweetest and most nourishing of the earth's products.

Trees herald the spring with glorious banners of leaf and bloom; they clothe the autumn in garments of gold and royal purple; bared to the winter's cold, they are the harp of the winds and they whisper the music of the infinite spaces.

Before the earth could be peopled, it was set thick with trees; and when man has run his course and the race we know has disappeared in the completeness of its mission or perishes in the destruction of its trees, the earth will spring up again with new forests to shelter and sustain a new race of men and beasts and birds to work out a greater destiny. Perhaps if we are wise enough to replenish our wasting forests and to make ourselves worthy of the gift of trees we may be permitted to accomplish that greater destiny which the Mighty Forester, the Perfect Orchardist, the Loving Father, requires in the fulfillment of His sublime purpose.

CLARENCE OUSLEY.

EFFECTIVE STREET PLANTING IN DALHART, IN THE EXTREME NORTH-WESTERN COUNTY OF TEXAS.

A PLAINS HOME MADE ATTRACTIVE BY WELL ARRANGED TREES.

TREE PLANTING NEEDED IN TEXAS

The planting of trees along streets and about homes has been going on since Texas was first settled. Countless millions of young trees have been dug from the woods and bottoms and transplanted in order to improve and beautify communities and homes throughout the State. It would be difficult to find a town or rural homestead where such planting has not been done to some extent. Yet tree planting in this State has barely commenced. There is an unlimited opportunity to grow trees for a wide variety of purposes. We have not yet begun to plan for the future in our tree planting. There is a lack of system and foresight in much of the planting done in the past. We do not appreciate the satisfaction which would be felt in later years for trees wisely selected and properly planted today.

Town and city streets should be planted, not as a result of scattered individual efforts, but according to definite plans for the selection of species, regularity in planting, and proper care of the trees afterward. Shade trees are important in front of vacant lots as well as in front of residences. Every city should have its parks, the smaller ones near business centers, to serve as beauty spots and rest places and to vary the monotony of pavements and buildings. Green grass, cool shade of trees and scattered seats attract the visitor and soothe the mind and body of citizens. Larger parks and playgrounds have their place in the outskirts of every city. Ordinances should be passed in order to protect trees on streets and in parks. No city is too small to make these provisions.

School grounds are often destitute of shade trees and almost invariably are less attractive in appearance than other grounds in the community. Country roadsides are not only unplanted and neglected so far as efforts at beautification are concerned, but in some instances they are despoiled of the trees nature has grown there through needless and almost wanton cutting by county road officials. There are many other places and conditions where planting is not as yet considered but where there is a distinct and increasing need for trees. Fence posts and fuel for farms and ranches in many treeless counties can be grown at home. Most farms in Texas need windbreaks and shelter belts to protect crops and buildings from hot, drying winds in summer and cold blasts in winter. Trees as shade for stock and to benefit crops, groves to furnish home supplies of fuel and posts and other forms of planting for profit in fruit and nuts, as well as to make treeless farms and homes more attractive, call for new thoughts and demand our present consideration.

The difficulties in growing trees where rainfall is inadequate and conditions are not the most favorable for tree growth should only stimulate a desire to succeed in planting. There are unquestionably many

species of trees as yet untried which are adaptable to the western portion of Texas. It is the desire of this department to encourage an interest in tree planting of all kinds and to aid with advice, experiments and demonstrations in this laudable work.

STREET TREES.

Every street, unless it be the business street, should be evenly and uniformly planted. Single species are preferable to a number of different species for a given street since greater regularity can thus be secured. It is unfortunate that town lots are allowed to remain without trees until the houses one by one are erected. The average city street today has some lots well planted, others poorly planted and still others, generally where there are no buildings, without trees entirely. Uniformity in a street cannot be obtained so long as this practice is continued. Owners should act together in selecting trees and having them planted by competent persons, or else, as is customary in States where trees are given the best attention, the entire work should be done by the town or city and assessed to all property owners. It is impracticable to correct mistakes in past planting but it is easy to secure uniformity when new streets are being laid out. Some of the best city planting in Texas today is done by real estate concerns which are opening new subdivisions.

It is the duty of the city as a whole to see that property owners conform to well established rules covering the planting, spacing and species to be used and to protect the trees from injury by horses, careless contractors, who may fasten guy wires to them or dump building material against them, mutilation by careless linemen and the numerous other sources of injury to which trees are exposed. Building regulations are accepted as the only means of securing safety and uniformity in construction. Why should not similar regulations be enforced to secure the right kind of street planting, care and protection? A small city can as well safeguard the welfare of its street trees as a large city. Many years are required to develop good trees and their value is too priceless to permit them to be butchered by linemen, teamsters and workmen and injured through the neglect or at the whim of property owners. Most people by nature love the trees and desire to see their welfare secured. This can best be done by placing the entire care of the street trees in the hands of a competent person or commission of the city and enacting suitable ordinances with penalties for their violation.

It is common practice in this State to dig wild trees in the woods and bottoms and plant them out. Most of the fine old trees in towns and cities were secured in this way. Wild trees are not so good as trees grown in nurseries under cultivation, but, nevertheless, this has been our source of trees in the past and will continue to be for many years to come. A little care in selecting and planting such trees will be repaid by far better results. Many species have been planted which have not proven to be best in the long run. While hackberry is the commonest planted tree in the State, there are many sections where

other species would be preferable. One should determine which species seems to be the best available for planting and then give the utmost care to digging, planting and later care of them.

CITY PARKS.

The time to establish city parks is when towns are small and land is cheap. There are notable examples among the newer towns of western Texas where areas have been donated, or purchased, and set aside for future parks and playgrounds. In many towns areas unsuitable for building purposes, such as stream banks and uneven land, may be cheaply and wisely selected for park purposes. Suitable parks are rare in towns or cities with populations of less than 8,000 to 10,000 persons. The future importance of parks is little considered by the people of smaller communities. Public spirited persons owning real estate in small places could leave no better monument than the gift of a park site to their towns. Boards of trade, women's clubs and other organizations can render a real service to their fellow citizens by working for their establishment. The time must inevitably come when a city without parks must spend large sums of money in order to obtain them. This is true of park development in many of the large cities today.

The stranger is greatly impressed by the appearance of a city which has parks and rest places scattered conveniently about the business as well as the residence sections. He goes away feeling he has visited a place which he would be glad to make his home. Such a city is benefited in a business way, grows in population, improves in the health of its citizens and increases in the esteem of every visitor. There are many types of parks which add beauty to a city. Among these are small triangular plots at intersections of avenues, narrow strips of green here and there, open land about public buildings and rest places near busy streets, with convenient benches, plenty of trees for shade, green grass, flowers, shrubbery and drinking fountains, where people may stop for a moment and children may play. A little care and watering will keep most park lawns in fine condition without the necessity of annoying "keep off the grass" signs.

Trees should be planted in parks as soon as they are established, even if other improvements are not made at once. In the larger parks as many different species as possible should be selected and the trees labeled so that people may learn to distinguish them by name and increase their interest in trees. If the soil about the trunks is loose, free from grass and well watered there are kinds of trees without number which can be grown in every section of Texas. In many of the new cities of the Panhandle there are parks in process of development which will be a lasting tribute to the foresight and progress of their citizens. The fine old cities of the United States which appeal to the resident and visitor owe much of their attractiveness to the parks and trees. Let us plan ahead so that our towns, rapidly increasing in size and importance and destined to become prominent cities of the future, may have the benefit of well arranged parks and beautiful shade trees.

IMPROVING THE HOME GROUNDS.

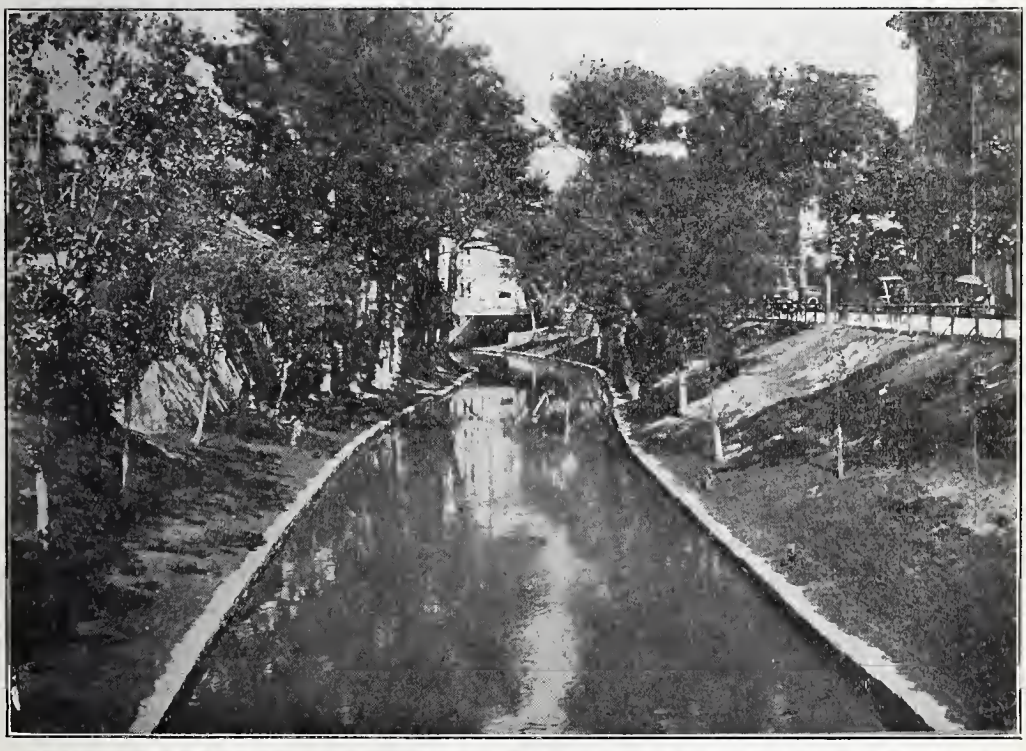
It is a credit to the home loving and home making instincts of our people that tree planting and the preservation of native trees about the home grounds is general throughout Texas. On the farms and ranches as well as in the cities and towns of the plains section it is gratifying to see the painstaking efforts to grow trees, even under conditions extremely unfavorable to tree growth, and the success which attends such efforts. Farther east, where trees grow naturally and thrive with little attention, the home grounds become bowers of verdure and furnish the most comforting and restful shade. Under these favorable conditions a large variety of species is possible and planting is extensive. Neglect in pruning and in the general care of trees, however, is far more noticeable than in western sections. The grounds about the average home in Texas, whether allowed to become a tangle of trees and shrubbery or arranged formally and given the greatest care, indicate a love of trees and a desire to make the home attractive even where street and roadside trees may be neglected.

Success in the planting of home grounds is much more easily attained than along streets and roadsides. There is less danger of injury by man and beast and the trees benefit from the superior soil conditions, watering and mulching, which too often are not supplied to the trees outside the grounds, but which the owner is painstaking to give the trees about his house. Our grounds may be made more beautiful, however, by selecting species for planting which are known to be long lived and free from undesirable habits and by giving the trees more attention when young as well as when old. A much wider range of species may be planted than is practiced at present, and it is often of interest to use as many different kinds as possible. Fruit and nut trees have their place in the home grounds and may there be made to furnish shade and the best of fruit and nuts at the same time. Coniferous evergreen trees are particularly desirable for home grounds, but should not be planted close to buildings. Banks of shrubbery are most desirable near the house, while trees should be placed some distance away to allow for better circulation of air in summer and prevent injury to buildings from dampness. Thin foliaged trees, however, may be placed closer than other trees if partial shade to windows and porches is needed. Individual opinion should govern the arrangement of the planting, but in general it is better to avoid a stiff, formal appearance. For this reason groups of trees should supplement or take the place of rows, except along drives or for background effects. Evergreens should preferably be arranged in groups unless they are planted for a hedge.

SCHOOL GROUNDS.

In many cities and most country districts the school grounds are unattractive through lack of trees. There may be a few poorly placed trees, but in too many cases there are no trees at all and the appearance is positively ugly. It is the exception rather than the rule when one

PARK SCENE IN SAN ANTONIO.



BEAUTIFICATION OF A WATERWAY THROUGH THE CITY OF SAN ANTONIO.

finds school grounds well planted and attractive. Flower beds and green lawns are often not compatible with the trampling feet of hundreds of children, but there is no excuse for the absence of shade trees. Fruit and nut trees, of course, are not recommended for school grounds. Trees without edible fruits and with strong branches are preferable for this kind of planting. The boys and girls themselves furnish the motive power and machinery for getting the work done. They would enter with enthusiasm into the project of planting and caring for the trees. The children may even have a nursery for growing the trees from seed. Many schools are already doing this in connection with their class work. What has been said about city parks with reference to labeling the trees applies to school grounds. The children should become acquainted with trees and their habits perhaps first of all from the trees on the school grounds.

COUNTRY ROADSIDES.

Who would underestimate the value of trees lining the hot, dusty highways of the plains, and along the roadsides throughout our rural communities, where trees are not growing naturally? Yet there is a distinct and noticeable lack of such trees along the public highways of Texas. They are needed to help break the force of the wind at all seasons, to furnish welcome, shady spots, which lessen the glare of the sunlight and to make resting places for highway travelers. Tree planting and road improvement should go hand in hand. In many States this is done, and where the State supervises or aids in road construction it is usually the practice to set out trees or to furnish them to the counties or towns. Some state forestry departments are supplying stock at cost for such planting. In Massachusetts an organized forestry association is using its efforts to secure rural roadside planting by offering prizes each year to the towns which plant the greatest number of trees along the country roads. Many States have roadside tree laws and provide for the appointment or election of county tree wardens to supervise roadside planting and prevent needless injury to existing trees. There is an increasing interest in roadside planting in Texas as shown by the efforts of women's clubs and other associations.

Trees should not be so close together or so near the roadway itself as to prevent drying after rains or to interfere with roadway improvement. Especially is the latter to be considered in view of the grading and improvements now being made in almost every county. There is a tendency to remove existing trees where they are growing along narrow roads or too near the roads. Many fine trees are necessarily sacrificed, but many others are needlessly and almost wantonly destroyed. There should be a law to prevent unnecessary cutting of roadside trees.

The time will come, and it is near, when all the principal highways will be avenues of travel for thousands of people from all sections of the State and outside the State. Well planted trees on the chief highways would reflect great credit on the State and communities which made such planting a reality. Many States take well merited pride in their public roads. Invariably fine trees, either native or planted, are

found along these roads and it is considered criminal to injure or destroy them. We are beginning to consider the value of fine roadside trees in Texas, and every effort should be made to stimulate an interest in this phase of planting.

WINDBREAKS AND SHELTERBELTS.

Protection planting has a recognized value wherever crops, buildings, soils or stock are exposed to unfavorable climatic conditions. In regions of little rainfall windbreaks or shelterbelts, by reducing evaporation, prevent loss of plant and soil moisture. In sections of Kansas, Nebraska, Iowa and other prairie States the windbreak is an important part of the arrangement of crop areas on the farms. In Harvey county, Kansas, there are 170 miles of osage orange rows. One township in Platte county, Nebraska, contains 22 miles of rows, belts and groves of windbreaks, mostly cottonwood. York county, Nebraska, has 40 miles of windbreaks in one township, and Fairbault county, Minnesota, supports 400 acres of cottonwood and willow shelterbelts in one township. In Oregon, Lombardy poplars are extensively planted for orchard windbreaks. In Texas, particularly on the plains of the western counties, practically the same conditions affecting agricultural operations are encountered as in the Middle Western States just mentioned. In this part of our State planting trees for protection purposes is economically desirable. In the stock raising sections the value of protection planting should be recognized. Shade in summer is an asset to the beef grower. In winter stock can be brought through in better flesh on less feed if protected from the cold, biting winds.

Many far-sighted farmers in our State are alive to these considerations. In South Texas windbreaks have been planted in Willacy county to protect citrus groves, and in Brooks, Aransas and Cameron counties to protect diversified farm crops. In the Panhandle groves and rows of trees have been planted in Ochiltree, Roberts, Hemphill, Gray, Swisher and doubtless many other counties to protect crops and soils on the windswept plains. When the value of shelterbelts is more generally known, protection planting will become a definite part of the plan of management on every well conducted prairie farm.

INFLUENCES OF WINDBREAKS AND SHELTERBELTS.

The injurious effects of air currents increase or decrease with their velocity. Shelterbelts, by decreasing the velocity of air currents striking them, exert a beneficial influence over adjacent areas, the degree of protection varying with the height and density of the windbreak. Height determines the distance to which the protection is felt. Investigations have shown that the protected area extends approximately five times the height to windward and fifteen times the height to leeward of the windbreak. Density controls the relative amounts of air which leak through rather than are deflected upward and over the windbreak.

During dry periods shelterbelts check the drying out of crop plants themselves and by decreasing soil evaporation automatically increase

the supply of available soil moisture over the protected area. Crop yields are thus increased. Investigations by the United States Forest Service show that yields on protected areas have been increased 35 per cent above normal. In one instance a well protected field of corn made a net gain above normal yield equivalent to the product from an area as long as the windbreak and twice as wide as the height of the trees. Statistics further show that areas protected by windbreaks have produced crops under the most severe growing conditions when crops on unprotected areas under the same conditions were failures. When high winds occur shelterbelts prevent breakage of crops and orchard trees as well as the burying of field crops under loose, fine soils which may be transported by the wind. The protection afforded stock has already been mentioned.

The wood products obtained from thinnings made in the windbreak are further advantages which should not be overlooked. It is obvious the cuttings cannot be made too heavy, but with care the windbreak can be made to furnish a large part, if not all, of the material used on the farm.

Ranch buildings are made more habitable when protected from the blasts of hot and cold winds. A quite intangible, but none the less real, value of the windbreak is the aesthetic one. Who can estimate the value of personal comfort and satisfaction? It must be conceded, however, that the value of a farm supporting the proper growth of trees is greater than that of a similar farm barren of tree growth.

Certain slight disadvantages are incident to windbreak planting, but they are negligible when compared to the advantages. The windbreak must be located where it will furnish the maximum protection and it is thus necessary to use soil areas which could be planted to crops. In this connection the windbreak should be regarded as crop insurance and in those sections where protection planting is necessary 10 per cent of the farm area might well be devoted to windbreaks in view of the protection and increased crop returns secured on the remaining 90 per cent.

As a result of shading, coupled with competition between the roots of the trees and the crop plants for food and moisture, there is a loss in yield on the strip of land immediately adjoining the windbreak. This slight loss is more than offset by increased returns from the remainder of the protected area. It can be further lessened by wise selection of the trees, the direction of the windbreak itself and by proper handling afterwards. Do not plant trees that have wide-spreading crowns or rambling root systems. Cultivation conserves the available soil moisture and consequently restricts the spread of the roots in their search for food. A ditch dug on the field side of the windbreak a reasonable distance from the base of the trees will effectually stop the spread of the roots in that direction.

ARRANGEMENT AND LOCATION OF WINDBREAKS.

Three types of windbreaks are generally recognized: single rows of trees, belts composed of two or more rows and groves of trees in natural

arrangement. The belt and grove types, since they are denser, are more efficient than single rows of trees. Four parallel rows make an excellent windbreak. Several rows of shrubs planted on the windward side of the main windbreak will further increase its efficiency by deflecting air currents upward before they reach the trees. If the windbreak is composed of hardwoods it may be made denser by underplanting with conifers or shrubs. A belt type of windbreak composed of three rows of shrubs and four rows of trees, spaced three feet and eight feet, respectively, would be thirty-three feet wide and were the windbreak one-half mile long the total area occupied would be two acres.

The location of the windbreak should, in all cases, depend on the arangement of the crop areas, the direction of the prevailing winds and the topography of the area to be protected. Locate the windbreak on the windward side of crop areas and at right angles, or nearly so, to the prevailing winds. The windbreak should always be on the higher elevations and never in the bottoms. In this State, since southwest winds prevail in those sections where shelterbelts are most needed, the planting should generally be made along the south and west boundaries of the farm. If the area to be protected is a large one it may be advisable to plant cross belts inside the boundaries to supplement the main windbreaks. Single rows of trees may be planted for cross belts, but in all cases, in this State, the belts should be laid out east and west to reduce shading and secure maximum protection. Because of the zone of relatively still air currents to leeward of a windbreak it should not be located within one hundred feet of the buildings.

Hedgerows are not a substitute for windbreaks or shelterbelts. They provide shelter from insects and rodents and because of their relatively low height the expense of planting is out of all proportion to the protection afforded. Finally, their heavy root system, due to the unbroken line of vegetation, saps the soil of food material which the crop plants need.

FENCE POSTS AND FUEL.

Over the greater portion of Texas every farmer should be concerned with the problem of growing at least part of his home wood supply. Vast areas are practically treeless. Thirty-two counties in West and Northwest Texas with a total area or 22,550,000 acres have 62 per cent of their area in improved and unimproved farms, but only a little more than three-fifths of 1 per cent (8,532 acres) of the farm land is wooded. The United States Forest Service* estimates that 2,500,000 acres in the prairie and plains sections of Texas should be devoted to woodlot planting in order to preserve the balance between woodland and farm. Eight Panhandle counties in which approximately 100 per cent of the entire area (5,100,000 acres) is farm land are wooded to the extent of less than seven one-hundredths of 1 per cent (3,468 acres) of their entire area. That wooded areas do not interfere with the best agricultural development is shown in the Black Prairie section of the State, where

*Year book of the U. S. Department of Agriculture, 1909.

ten counties with approximately 74 per cent of their total area (5,800,000 acres) in farm land, 58 per cent of which is improved, devote more than 18.9 per cent (808,862 acres) of the farm area to woodlots.

It is in the nearly treeless sections that the demand for wood products becomes a pressing problem and where woodlot planting would be a material help to every farmer. Local prices for wood are usually excessive. Fence posts and fuel are rapidly becoming more expensive and difficult to secure. The woodlot can furnish such material; even larger sized trees if time is allowed for them to grow. Farm soils are not so valuable that an acre, or a few acres, cannot be devoted to the woodlot. A well-to-do farmer can easily afford to maintain a woodlot and a poor farmer cannot afford to lose the benefits to be derived from one. Difficulties encountered in planting and maturing the woodlot in those sections where they are most needed are no argument against planting them. Proper care in the initial planting and cultivation afterwards will insure the success of the undertaking.

No soils are too poor in plant food to support a tree. On every farm are areas which cannot be profitably used for growing crops. A woodlot on the farm means more acres producing revenue and fewer idle acres. Plant the corners, the rocky areas and those places where erosion will result if the land is not protected. Material benefits may be derived from the woodlot as well as from the garden and orchard. The woodlot, if properly located, will furnish protection to stock and buildings. It can be made to yield a direct financial revenue. Figures are not available from woodlots planted in Texas, but the profits realized in other States are shown under the paragraph headed "Profit from Planting."

THE USE OF WILD AND NURSERY GROWN STOCK.

It has been pointed out that wild stock is the common source of supply where native trees are found in abundance. In many of the smaller towns nursery grown trees have scarcely ever been used. There is a tendency, however, to recognize the better quality of trees grown in nurseries and as a result commercial dealers are being called upon to supply the trees for much of the city planting today. It would be unjust to criticize the use of wild stock, but it is fair to say that the objections to its use lie chiefly in the methods of digging and handling the trees for transplanting purposes and in the large size of the trees so generally used. It is important that trees not over two and one-half inches in diameter one foot from the ground be used and that as much of the root system as possible is secured. If the planting can be done carefully and the roots not allowed to dry out during the operation of transplanting, much better results with the use of wild stock may be obtained. Trees growing in the open are preferable to those taken from shady places. The stems should be straight and free from forks or branches near the ground. The top must, of course, be somewhat reduced before planting in order to conform to the diminished root system. In most situations, however, it is undoubtedly a mistake

TYPICAL STREET IN A SMALL CITY WELL PLANTED WITH HACKBERRY AND PECAN.

A STREET WHICH SHOWS LACK OF UNIFORMITY IN PLANTING.
(Note the care with which the native oak has been preserved.)

to cut back the top to a bare pole, especially if care has been exercised to secure good roots.

Nursery grown trees are generally free from the objectionable features common to wild trees and have a much better chance to survive and grow rapidly after planting. If one has not the time to grow stock from seed at home and is unable to secure satisfactory stock from the woods it may be purchased from reliable nursery dealers. The chance of failure is lessened if planting stock is ordered from nearby dealers as long shipping distances are avoided. A few nursery dealers in Texas advertise stock in lots of one thousand at very reasonable prices, but most nurserymen are not as yet prepared to furnish trees for woodlot and windbreak planting at sufficiently low prices to interest prospective planters. As interest in planting increases, however, and there is a larger demand for the better quality of trees grown in nurseries it is certain that dealers will not only grow the stock to meet this demand, but that prices will be low enough to enable the planter to buy trees in lots of one thousand rather than by the dozen or single trees. Further information regarding the location of commercial nurseries and their prices for stock will be furnished upon request.

GROWING NURSERY STOCK AT HOME.

Cultivated stock, since it is grown under the most favorable conditions, is hardier than wild stock, free from disease, insect injuries and wounds, and the crown and root system have been forced into more compact form. All these characteristics insure thrifty growth even with unfavorable soil and moisture conditions. The prospective planter who desires to grow planting stock at home can do so on a small scale without difficulty and at much less expense than the stock can be purchased from commercial nurseries. Seed for planting may be purchased from reputable seed dealers or collected locally in the fall, which is the time when the seed of most tree species ripens. Seed which is wormy, mouldy or light in weight should always be rejected. In storing seed over winter it is well to remember that seeds which remain on the trees until spring should be sacked and kept in a cool, dry place. On the other hand, seed which lays on the ground over winter is best stored between layers of earth in a cool, moist condition or else planted at once. If seed is to be purchased from dealers it should be ordered early, thus enabling the dealer to plan ahead on filling the order or to notify the planter if he cannot supply the seed. Seed collected in one region for planting in another with widely different climatic conditions may give poor results.

THE NURSERY.

Nursery soil should be loose, fresh and free from weeds. The best site for a small home nursery is a well drained and cultivated portion of the garden. Nuts and other large seeds may be planted in long rows in the fall or early spring. With this exception it is better to plant the seed in the early spring in beds about four by twelve feet.

Beds of this size are easy to handle and the germination of small seeds is better secured. If several beds are to be planted, paths two feet wide between the beds and several inches below their general level will facilitate access to the nursery and give better drainage. The seed should be planted in drills to a depth of two or three times their thickness. Coniferous seeds are frequently sown broadcast in the beds and lightly covered with soil. Hard coated seeds, like black locust, can be made to germinate quicker by soaking them in warm water before planting. After planting the seeds the beds should be watered and mulched to prevent subsequent drying out, but as soon as the young trees make their appearance above ground the mulch should be removed. Lath frames supported on posts are considered absolutely essential, particularly with conifers, in order to furnish partial shade after germination. The sides are often enclosed with boards to prevent unnecessary drying of the soil. In well ordered nurseries the beds are also screend to keep rodents and birds from eating the seed before germination and the young seedlings afterwards. During the first growing season it is necessary to keep the beds well weeded and occasionally watered to prevent the ground from becoming dry.

In order to secure a more compact and fibrous root system, which will better enable the trees to survive when they are planted in the final site, all seedlings should be transplanted to rows in the nursery for at least one additional year. Seedlings of most hardwood or broad-leaved species are transplanted at the end of the first growing season; conifers should preferably remain in the seed beds two years. When taking the seedlings from the beds eare should be exercised to thoroughly loosen the soil so as to prevent all possible damage to the roots. Unusually long roots, together with part of the crown, should be cut back except with conifers, and these should never be pruned. Transplanting should be done on cloudy days, always bearing in mind that the roots of the seedlings must be kept moist during the operation. The spacing in the transplant rows will depend somewhat on the area available, but four-foot rows with the trees two feet apart in the rows will permit of horse cultivation and allow sufficient space for growth during the year. At the end of the second year the trees may be root pruned in the rows, again transplanted or set out in the permanent plantation if they are of suitable size.

PLANTING THE TREES.

In Texas planting between late fall and the first of February gives the young trees the best chance to become established. If the planting is done before or during a rainy period the young trees are far better prepared to survive the dry spells which may follow in the early spring. For this reason it is unquestionably true that the present date of Arbor Day (February 22) is too late for the tree planter to secure the best results.

The roots of the young trees should be kept moist from the time they leave the nursery, or are dug in the woods, until they are finally planted.

While this rule applies to all trees, success in planting conifers particularly depends on keeping the roots moist. Most nursery dealers will ship coniferous trees only with balls of earth and well wrapped in burlap. In general the roots may be kept moist by covering them with wet burlap or moss; small seedlings may have their roots immersed in a bucket of water or thin mud. To avoid delay the planting site should, of course, be prepared in advance of the planting. The conditions under which the planting is to be done should determine the kind and size of trees used. Street and yard trees may be larger and of wider variety than those for windbreak or woodlot planting.

STREET AND YARD TREES.

On city streets use stock that has been transplanted one or more times. Such trees are better able to stand removal to the unfavorable surroundings usually found on city streets. Trees having a diameter of one and one-half to two inches one foot from the ground are best, since they are not too large to readily establish themselves and yet are large enough to insure satisfactory development after planting. They should have straight stems and be free from forks and crooks. The height at which the crown should begin depends upon the traffic where the tree is planted; eight feet is usually considered standard. The tree should be free from disease, insects and wounds.

The size of the openings in which the trees are to be planted depends on the size of the trees and the character of the soil in the planting site. The hole should afford ample growing space to allow the roots to spread. In compact, clayey soils the opening is necessarily larger than would be required in loose, porous soils. A good rule is to make the tree pit at least twice as wide and twice as deep as the root system of the tree to be planted. In some cities, where tree planting is carried on systematically, the openings are made six feet long, three feet wide and three feet deep. To furnish food for the young tree during the early stages of its growth enough fresh, new soil to half fill the tree pit should be on hand before the planting.

In order to preserve the necessary balance between the roots and the crown the young tree should be pruned before setting and all bruised and broken parts removed from the roots. Use sharp tools in pruning, as ragged wounds are slow to heal and cut side branches directly above strong, healthy buds. The roots of the tree, arranged in their natural position, are placed in contact with the new soil which has previously been spread in the bottom of the pit. With the tree held upright in the pit the rest of the new soil is thrown in around the roots and tamped closely and firmly about them. No air spaces should be left around the roots and no leaves, twigs or other vegetable matter should come in contact with them. The remaining soil is then thrown into the pit and tamped frequently, but the final layer of soil should be left loose to act as a mulch. As each layer of soil is tamped during the planting it should be moistened but not made too wet.

A stake, or, better still, two of them, should be set alongside the

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young tree to furnish support and hold it upright in the ground. This may be done by wrapping a piece of common garden hose, through which a wire has been run, around the trunk and attaching the ends of the wire to the tops of the supports. After the tree has been planted and staked a wire netting, close meshed chicken wire will answer, may be placed around the trunk to protect the tree from mechanical injuries incident to street traffic.

The width of spacing between the trees in street planting depends upon the species planted and the local conditions. Some species need more room for crown and root expansion than others. The space available for planting, the cost and various other factors must also be considered. For most city planting under average conditions a spacing of 30 to 35 feet apart is considered standard.

In planting trees in yards or similar situations where growing conditions are less severe than in street planting the size of the planting stock is relatively unimportant and the trees may be smaller or larger than is necessary for street planting. Transplanted trees, however, will respond more quickly, grow faster and give the best results. Conifers should in general be used only for yard planting in this State and stock three or more years old and at least one transplanted should always be selected. Hardwoods, when used for yard planting, should be two or more years old but should not be larger than three inches in diameter one foot from the ground unless unusual precautions are taken in planting.

SHELTERBELT AND WOODLOT PLANTING.

In both these types of planting the trees used should be smaller than for street and yard planting. Small trees are better able to stand the shock of transplanting and the labor and expense of planting are lessened. When planting hardwoods use trees from eighteen to thirty inches in height and for conifers use transplanted trees appproximately twenty-four inches in height. The planting of seeds directly in the final site is not advocated since experience has shown that good results are seldom secured by this method.

Previous and careful preparation of the planting site is essential for the best results. Deep plowing during the previous May or June, followed by surface cultivation during the rest of the growing season, will keep down the growth of grass and weeds and help to conserve the soil moisture. Such preparation also insures a soil, free from coarse material, which will pack closely around the roots of the trees. Sod bound or clayey, compact soils with an impervious subsoil should be deeply plowed two years before the planting and the sod or heavy soil worked down. Such treatment kills out the native grasses and renders the soil loose and porous. Splendid results have been obtained by plowing under and disking a cover crop of cowpeas previously grown on the planting site.

Two methods of setting out the trees may be used: plow or hole planting. Planting with a plow is the cheapest and quickest method if the

trees are sufficiently small and a large number are to be planted. Lay out the tree rows, marking them along their length and at each end by stakes. Plow down the row and deepen this furrow by plowing back again, the finished furrow then being eight to twelve inches in depth. Hold the tree by its top, the roots being in the bottom of the furrow, and plant by pulling the soil in from the sides and tamping it firmly around the roots with the feet. When the planting is complete the trees should be upright in the rows and about one inch deeper in the ground than they grew in the nursery. The entire length of the furrow is then filled level with the surrounding surface. No hills or ridges should be left along the rows. It is advisable to plow only one or two furrows at a time as the soil dries out quickly and in such condition is injurious or fatal to the young trees.

Planting in holes is the best method if the trees are of fairly large size, the growing conditions are unfavorable or there are not many trees to be planted. Make the hole large enough to accommodate the entire root system of the tree. Set the tree upright in the hole, taking care to spread out the roots. Fill the soil in around the roots and tamp firmly with the feet. To finish the planting it may be advisable to water each tree after it has been set.

In shelterbelt and woodlot planting the spacing of the trees is governed by the purpose for which the planting is made. For shelterbelts, since density is the main requisite, four-foot spacing in the rows with the rows eight feet apart is good practice. This spacing between the rows, while wide enough to permit of easy cultivation, will also force height growth, shorten the time necessary for the crowns to close and automatically help to check the growth of weeds and grass. Where rainfall is insufficient a spacing of eight feet each way admits of cross cultivation and has given satisfactory results.

For fence post planting the trees may be spaced four feet apart in the rows with the rows six feet apart. This somewhat closer spacing forces height growth and produces the straighter, cleaner stems desired in fence post trees and at the same time admits of cultivation. Under extremely dry land conditions a wider spacing is perhaps desirable or else thinnings should be made earlier in the life of the plantation.

When planting for fuel the spacing may be wider than for either of the types mentioned. In a fuel wood plantation the form of the tree is not so important as the production of wood, and wider spacing makes for spreading crowns, rapid growth and a consequently higher yield in wood.

SPECIES FOR PLANTING.

When selecting tree species for planting in Texas the State should be considered by sections rather than as a whole. Factors of soil and climate vary so widely that trees entirely suitable to one region may fail in another. In East Texas growing conditions are unusually favorable and most of the tree species found in the eastern and northern States may be grown. Farther west more compact soils, less rainfall, drying winds with increased evaporation and more intense sunlight

BARREN APPEARANCE OF A PLAINS FARM WITHOUT TREES.

A SMALL TRACT PLANTED WITH TREES AND RECENTLY DONATED TO A CITY FOR PARK PURPOSES.

tend to limit the choice of species. On the northwestern plains cold winters are encountered, and the number of trees adapted to the region is still further reduced as they must resist all other unfavorable conditions and also be frost hardy. Nevertheless, where soils are cultivated and the trees watered during early life a wide range of species is available for planting throughout the Panhandle country. In South Texas the selection tends toward thin foliaged types of semi-tropical trees. Palms and trees of the bean family are prominent, although species from all sections thrive when given proper care.

STREET AND YARD TREES.

In this type of planting local climatic conditions are not so important as in windbreak or woodlot planting since the trees may be and generally are given better care. The main factors governing the choice of species are length of life, rate of growth, strength of the wood, resistance to insect attacks and disease and the ultimate form of the tree. It is probably true that a larger variety of trees can be found growing along the streets and in the home grounds in Texas as a whole than in almost any other State in the country. This is because Texas is the natural meeting ground for species from the northern and eastern States and from Mexico. One has only to examine local tree planting anywhere, except in western Texas, to find a surprisingly large number of species in a thrifty condition.

In the Panhandle counties black locust represents at least 90 per cent of the species planted. In spite of this fact many other species grow well and should be more generally considered. Among those which have been examined and which should be more extensively planted are Russian wild olive, silver maple, box elder, western cottonwood, green ash, silver poplar, thornless honey locust, Japanese privet, American elm, osage orange (Bois d'Arc), salt cedar, Oriental arbor vitae, Texas umbrella, red cedar and the willows and mulberries. Lombardy poplar is much planted but is apt to become unsightly after a period of years. Catalpa does not make a good tree on the high plains. A few specimens of hackberry are found but they lack the vigor and beauty of these trees as grown east of the breaks in the plains. The pecan seems to grow extremely slowly but should be more carefully tested out. Several of the pines, such as western yellow, Corsican, Scotch and others are grown, and they are worthy of consideration for yard purposes. This is also true of a number of cedars and several varieties of cypress. Cedrus deodora gives promise of being a splendid ornamental tree. There are many others which it is hoped will be tried out in the near future.

In southwestern Texas, where rainfall is entirely inadequate for good tree growth and where alkaline soils must be considered. black locust, western cottonwood and salt cedar appear to thrive. In Pecos even the business streets are lined with salt cedars, and the appearance is most attractive. This tree has actually escaped to waste areas where it is growing in thickets. Of the two varieties of salt cedar the plumosa

is the more desirable. Where the trees are well watered the wild olive, umbrella China, Japanese persimmon, mulberries and many others are growing well.

In the region south of San Antonio along the Gulf coast species of semi-tropical character make their appearance and are successfully cultivated. Eucalyptus is grown in San Antonio, although it is not frost hardy so far north. Oleander, pomegranate, yucca, various species of palmetto, camphor tree, olive, huisache, mesquite, horse-bean, loquat and various kinds of citrus trees are grown for street and yard purposes. To these are added the hackberry, catalpa, Russian, red and paper mulberries, box elder, silver maple, sycamore, Chinese arbor vitae, black and English walnuts, pecan, live oak and other species in abundance commonly found in other parts of Texas. A number of trees like camphor and the citrus varieties are not hardy far from the coast. In Corpus Christi one finds the salt cedar grown as arbors to shade walks and grounds. Farther inland mesquite and huisache are used extensively for the streets and yards and with occasional watering and pruning they make most desirable shade trees.

In central and eastern Texas the number of species grown for shade and ornament becomes almost unlimited. Among the best and most permanent of these for streets and yards are the sycamore, water oak (known as pin oak), Texas red oak, live oak, English elm, American elm, pecan and hackberry. There are many others which might be included, but observations show that these represent perhaps the best in our street planting over a wide area. European sycamore should be as good as the native species so commonly used.

The pecan should be far more extensively planted, both as a street and yard tree. It furnishes both shade and fruit, grows well in moist situations and makes a tree which will endure for centuries. Such trees as hackberry, chinaberry, especially the variety known as Texas umbrella, osage orange (Bois d'Arc), red cedar, arbor vitae, ash, elm and locust have contributed more to the beauty of our streets and grounds than other trees as they have been more extensively planted. In some central Texas cities, like LaGrange and San Saba, native live oaks of remarkable size and form are found along the streets as well as in private grounds. In other towns and cities through the prairie belts hackberry and American elm have been almost exclusively planted, but in many places the too extensive planting of hackberry has proved unwise and more recenting planting consists of elm and sycamore. On many of the newer streets in cities sycamore is exclusively used.

In the eastern counties many trees such as the hackberry and the live oak give way to trees more common to the southeastern Atlantic States. Here one finds the tulip, sweet gum, linden, post, overcup, Spanish, water and basket oaks, magnolia and black gum. Of course elms, sycamore and ash are widely used. Along the southeastern Gulf Coast semi-tropical trees predominate. Palms and camphor trees add much to the beauty of Orange, Beaumont and Galveston.

In the impervious soil of the post oak section, north and south from College Station, although within the range of a vast number of tree

species, many have failed to grow as well as do those in sections to the west and east. However, there are fine examples on the campus of the Agricultural and Mechanical College and in neighboring towns of live, water, red, overcup, burr and other oaks, bald cypress and pecan, as well as trees from other sections of this country and abroad. Among the most interesting of these are cork oak, Cedrus deodora, Lawson cypress, and Japanese varnish. The most common trees through this section are hackberry, American and cedar elms, post oak and red cedar.

Many trees which have not as yet been tried or the success of which has not been fully demonstrated may in the future prove to be desirable. It is not possible in this bulletin to discuss species for an area as large as Texas and do justice to many trees which are undoubtedly adaptable to one region or another.

WINDBREAK AND WOODLOT TREES.

The main requisites in a species for windbreak planting are long life, density of foliage and compactness of crown and root system. Since the windbreak may be cultivated, thus conserving the available soil moisture, the choice of species is fairly wide. Honey locust (the thornless variety is easier cultivated), osage orange, Russian wild olive, green ash, American elm, Russian golden willow and cottonwood are commonly used. If conifers are desired one may plant Austrian pine, Scotch pine, Chinese arbor vitae and a number of cedars. Red cedar should not be planted around orchards since this tree is a host plant for a transition stage (cedar apple) in the life of a fungus attacking fruit trees. A row of Russian mulberries or osage orange trees is frequently used as a preliminary planting on the windward side of a windbreak.

For fence post planting the species selected should combine durability of the wood in contact with the ground with comparatively rapid growth. Durability, however, in view of the present methods of treating posts to prevent decay is becoming less important. The black locust, in regions where the locust borer is not a menace, honey locust, osage orange, Russian mulberry and hardy catalpa, where soils are rich and considerable moisture is available, are among the best of the hardwoods for fence post plantations. Of the conifers, Chinese arbor vitae and red cedar may be planted. If it is the purpose to treat the posts before setting them one may include green ash, cottonwood, silver maple and elm in the list.

For woodlot planting adaptability to local growing conditions is the primary factor in choosing the species. A plantation established for fence post production will yield fuel wood as a by-product of the necessary thinnings, but should one plant for fuel alone, the cottonwood, green ash and black locust are comparatively fast growing and among the best which can be used.

CARE OF TREES AFTER PLANTING.

Failure too often results through lack of systematic care after planting. The trees have been transferred to a totally different environ-

ment in which the factors affecting growth are usually unfavorable, particularly during the early life of the trees. Shade trees should, therefore, be watered frequently. Street trees, in particular, suffer from lack of moisture because the surrounding surface is usually paved and the water falling on such a surface may not reach the soil at all. Even should an opening be left around the base of the tree constant trampling will so compact the soil as to render it impervious to moisture.

It is important to remember that a tree needs water not directly around the base but farther out where the feeding roots are located. Lawn trees should be watered at a distance from the base equal to the spread of the crown as most of the feeding roots are located under the "drip" of the branches. Since a street tree cannot be watered so far out from the trunk, one should loosen the soil around the base, make a circular trench or a number of small pits in this loose soil as far out as possible and slowly pour as much water into the depressions as the soil will take up. At all times the top soil should be loose to act as a mulch. Sometimes single tile pipes are set on end in the ground, or sub-irrigation systems are installed when the trees are planted, to facilitate watering. More water is necessary directly after the planting and during the several seasons immediately following while the young trees are becoming established. In general, a young tree requires twenty to twenty-five gallons at each watering; older trees require more. Fewer waterings are necessary if the soil around the base of the tree is kept free from grass and weeds and carefully cultivated.

In the windbreak or woodlot plantation it is not practicable to water individual trees. For this reason the plantation should be well cultivated directly after the planting and at frequent subsequent intervals. Cultivation makes the soil porous and capable of quickly absorbing moisture and checking evaporation. Hard, baked soils not only dry out quickly but often injure small trees by cutting the bark when the trunks move against the surrounding collar of soil. Cultivation should not be continued too late in the fall as there is danger of forcing new growth which an early frost will kill back.

As a tree grows older the roots and branches tend to maintain an equal balance. It often happens, however, that the root systems of shade trees are diminished by reason of excavations or the crowns become too large for the space that the trees may occupy and pruning becomes necessary. Severe pruning should be done in the winter or late fall when the trees are dormant. The crowns can be kept symmetrical and there is less danger of pruning too heavily if the cutting starts at the top and proceeds downward. Do not remove all the side branches at one time as this not only weakens the tree by depriving it of too much of the leaf surface, but there is the added danger of girdling the tree, particularly a small one. The side branches should be cut directly above strong, healthy buds. In removing limbs make all cuts parallel with and as close to the main stem as possible. The exposed surfaces of the wood should be covered with an antiseptic, waterproof dressing to prevent the entrance of insects and fungi. An application of creosote, followed by a coat of coal-tar, is an excellent dress-

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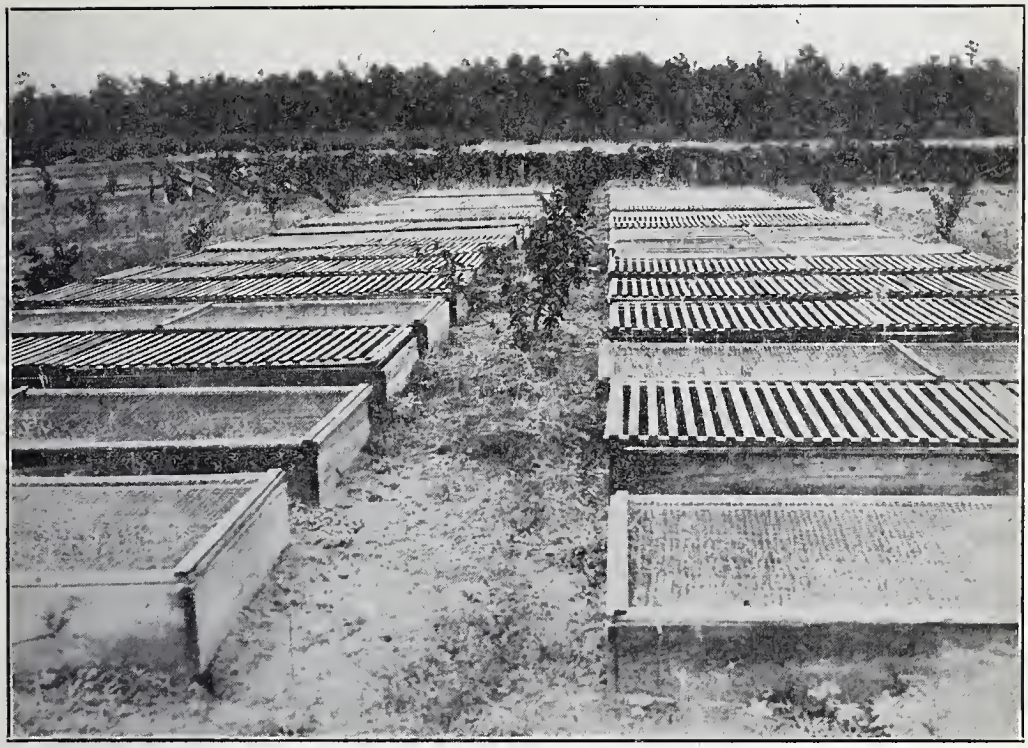
ing for tree wounds. Liquid asphaltum, and preparations containing it, are also efficient dressings, but they must be applied when hot. A good grade of heavy lead paint will be found to give good results. In any event the dressing must be renewed from time to time if checking, due to the drying out of the wounded tissue, exposes the wood surface.

In a plantation the trees will prune themselves to a limited extent, but some species when planted for fence post material should be artificially pruned in order to secure clear stems. One may remove side branches to the desired height but care should be exercised to make the cuts clean and not to prune so heavily that the future growth of the tree is lessened. In a shelterbelt the trees should not be pruned, as density is the main requisite. Sprouts should be removed from the base of a tree in any type of plantation.

Street trees are particularly liable to outside injuries. Such injuries when caused by horse bites, vehicles or any outside influence may be prevented by surrounding the tree with a suitable guard of wire, wood or iron. In many cities iron gratings are placed over the openings at the base of the trees to prevent injury by continual trampling of the soil. Overhead wiring often rubs the limbs and causes serious injury both by bark abrasions and the effect of electric currents A strip of wood placed on the limb at the point of contact will prevent such injury. Raising or lowering grades around established trees will probably result in their death by diminishing the supply of water and air or by exposure. When filling around trees use rocks for the first few layers and then cover these with soil or else build up a wall around the trees, leaving an air space of a foot or more between. When grades are lowered there is probably no remedy except the replanting of such trees as are not too large. Gas from leaking mains will soon impregnate the soil around the roots and kill most trees. By stopping the leak, removing the gas saturated soil and replacing it with fresh material the tree may be saved if the injury is not too serious.

When parts of a tree are diseased or wounded reasonable tree repair is justified provided the value of the tree warrants the expense. Wounds should be creosoted and tarred, but diseased portions of the tree should be thoroughly cleaned and filled with cement or asphaltum. Each serious case usually demands a distinct method of handling and for this reason one should avoid fakers and never trust the future welfare of his tree to any but competent operators.

Insect and fungus enemies are everywhere present and constant watchfulness is necessary to protect the trees. Since fungi gain entrance principally through wounded surfaces protecting the trees from outside injuries will generally prevent this trouble. Insects present a more difficult problem. The insect enemies of a tree may be grouped into three general divisions—the leaf eaters, the sucking insects and the wood borers—and because of their entirely different feeding habits each group requires special methods of control. The time when the insect is most vulnerable usually differs for each group and further complicates the situation. In general, spraying with an arsenate of lead solution (one pound to ten gallons of water) will effectually control leaf



SEED BEDS IN THE FOREST NURSERY AT THE TROUP EXPERIMENT STATION
(Five to eight thousand seedlings germinate in one of these beds—4x12 feet.)

GARDEN PROTECTED BY A WINDBREAK IN THE PLAINS REGION.

eating insects, but for sucking insects one must use soap or oil solutions which will clog the breathing pores.

Wood borers work beneath the surface and cannot be reached by spraying, but must be removed from the bark by digging them out or killed by filling the galleries with carbon bisulphid and then plugging up the entrances. Whitewashing the trees for protection against boring insects is common practice throughout the State. There has been very little investigation to determine whether this treatment is effective or not. When applied to young, thin-barked trees or to the smaller branches of any tree there is danger that whitewash will clog the breathing pores of the bark and cause a distinct injury. The city of Chicago recognizes this possible injurious effect and has prohibited, by ordinance, the whitewashing of city trees. As a further means of keeping these breathing pores open it is advisable to wash down the leaves, branches and trunk of a tree at frequent intervals in order to remove clogging particles of dust. The whitewashing of large trunks and thick-barked trees can do no possible injury and may be effective against borers.

The State Entomologist, at College Station, will gladly furnish information and answer inquiries concerning insect control upon request.

PROFIT FROM PLANTING.

Although direct financial returns through the sale of wood products cannot be derived from trees planted for shade or ornamental purposes there yet exists a definite value in many forms. Building sites are influenced by the presence or absence of appropriate tree growth. Trees planted for shade and landscape effects unquestionably increase real estate values.

In addition to such tangible results the sentimental or aesthetic value of the trees must be considered. One can scarcely estimate the value of a tree which has furnished shade and stood as an object of beauty for many years. Yet a value is recognized and fine old trees are often saved by building around them when improvements are made. Nor can one fix a value on the effect of tree growth in the health and everyday living conditions of a community. Statistics show that mortality figures rise during the hot months of the year and that trees, by giving off oxygen and moisture from the leaves, lower the temperature, purify the atmosphere and promote the general welfare of the community. Where the public highways of the State and the streets of cities and towns are planted with trees it is impossible to estimate in dollars and cents the prestige and recognition accruing to the commonwealth fortunate enough to possess them.

Various standards of appraisal have been devised to apply to shade trees. The "Parker Standard," probably the best of them, gives a rating of 100 per cent to a tree which is perfect in position, species, trunk condition, top condition, general desirability and scenic value. Reductions on a percentage basis are made for defects under these headings and the resultant figures totaled. This percentage rating of the

tree is then multiplied by a basal area valuation of $1 per square inch and the product is the value of the tree. By this means it is entirely possible to assign a definite value to a shade or ornamental tree. One of the eastern States has calculated by this method that healthy, well formed trees two inches in diameter at breast height are worth $3, and this value increases with diameter until a tree sixteen inches or over is worth $100 or more. At this valuation, which has been upheld in courts of law, one can readily see that shade trees are good investments. City trees also, unlike most other civic improvements, do not depreciate for a long period of years, but under proper care and at little expense increase in value with age.

Profits in woodlot planting are derived from the sale of wood products and vary in amount according to the species planted, the care given the growing trees and the length of time elapsing before the timber is marketed. With selected species and proper methods of management it is possible to grow fence post material in fifteen years or less in this State. Larger material would require a proportionately longer time. A few figures showing returns from actual plantations in different prairie States may be used to indicate what may be expected. In eastern Nebraska* a twenty-one-year-old green ash plantation yielded a gross revenue of $148 per acre on an investment of $39.17. An osage orange plantation produced $381.20 revenue from the sale of posts and poles on an investment of $90.25 in thirty-two years. Honey locust during a period of twenty-nine years produced a gross income of $193.43 on an investment of $60.50. All these figures are on an acreage basis and compound interest at 5 per cent is included in the figures of cost. The gross returns could have been increased under better methods of management. In Reno county, Kansas, on the well known Yaggy catalpa plantation,† the trees after ten years, under the best methods of initial planting and subsequent management, have yielded an annual return of $19.75 per acre. These returns are low when compared to the yield of cultivated field crops, but in view of the benefits and conveniences derived from a small woodlot such planting is amply justified.

The principal value of windbreak planting lies in the beneficial effects upon crops grown on the protected areas. Figures of increased yield as a direct result of the protection afforded by the shelterbelt have already been shown. Their beneficial effect on stock and ranch buildings has also been mentioned. These are to a certain extent intangible values but the product of the thinnings made in the windbreak are a source of direct financial return and must not be disregarded.

CITY FORESTRY.

Cities, both large and small and in all sections of the country, are awake to the necessity for systematic management of their street trees and as a result a new field of work has been created—city forestry. City forestry concerns itself with the establishment of municipal nurs-

*United States Department of Agriculture, Forest Service Circular No. 45.
†Kansas Experiment Station Bulletin No. 108.

eries, the selection of suitable species for planting and the proper methods of setting out, pruning, spraying or removing trees within the city. The scope of the work is both technical and administrative since it deals with the management of the trees directly and also enforces city regulations necessary to secure the most effective results.

In many sections of the country, city forestry work is well established. New York, Washington, Baltimore, Jersey City, Newark, Rochester, Chicago, Minneapolis, St. Louis, Los Angeles and many other cities, both large and small, have inaugurated departments which carry out the local policy of handling street and park trees. Dallas has so far been the only city in our State to create the office of city forester, but the results already attained should encourage other of our larger cities to follow suit. Virginia, Minnesota, a small sawmill town, has only eleven miles of streets, but under the care and direction of the city forestry department has parked and transformed them into boulevards, in addition to establishing a forty-acre city park. In our own State the local tree club of Temple, by means of a recently completed street tree census, has ascertained that 30,496 trees, embracing forty-nine distinct species, are growing within the corporate limits. Clubs and organizations of this kind may result in street tree commissions or city forestry departments vested with proper authority in the handling of their trees.

A definite method of procedure should be followed in establishing city forestry work if the best results are to be secured. In large cities there should be one governing body, usually the park board, highway department or a specially organized street tree commission, which formulates the city's policy in handling the trees. This body and its appointees should be entirely free from city politics, as results are not secured at once and changes in management are not desirable. One city employe, appointed by and answerable to this body, should be placed in charge of the actual work and given the authority necessary to carry it on. He should be authorized, subject to the approval of the governing body, to employ the necessary assistants, to devise and improve city regulations incident to the proper conduct of the work and to regulate and control all matters pertaining to the care and propagation of the city's trees. He should endeavor to secure an accurate record of the location, condition, species and number of the city trees and should prepare an annual report setting forth the past year's activities with the results and a proposed plan for the ensuing year. In addition, he should be ready at all times to furnish advice as to insect control and private planting and should prepare timely press notices containing information which his public should know.

The head of the city forestry department is variously styled "City Forester," "Tree Warden," "City Arboriculturist" or "Superintendent of Trees," but under any title his duties are practically as outlined above. Because of the many different phases of the work a special training is required and forestry schools are educating men to fill this demand. An efficient city forester should be an executive. His technical qualifications should embrace a knowledge of botany, insects and fungus

diseases and methods for their control, the characteristics and growth habits of trees and shrubs and landscape architecture. As a further desirable qualification he must be willing to admit and adopt new methods, the worth of which has been proven.

Cities and towns of from 4,000 to 15,000 inhabitants, of which there are a large number in this State, may establish a medium for handling their street trees at little expense. Interested citizens in each town could organize a tree club which would have for its object the compilation of a census showing the number, species, condition and location of the town trees. With this information at hand interest could be developed and subscriptions taken for carrying the work further. Temple, Texas, as already stated, has organized such a tree club and made the preliminary census. Interest was aroused in the undertaking by offering prizes to those making the closest estimate of the actual number of trees and many residents co-operated in the counting and listing.

Whether a city forestry organization is established or not it is desirable for every city to make regulations to protect its trees. City trees are greatly handicapped by reason of their unnatural surroundings and should be properly handled and protected. City tree ordinances, beyond setting forth the personnel of the governing body and the manner of appointing and duties of the city forester, provide for regulating the planting, spraying, pruning or removal of all trees, whether publicly or privately owned, and generally place the control of all such work under a city forester through a system of permits. Such ordinances may specify the kind, size and manner of planting of all trees within the city limits and also provide for the assessment of property owners who are benefited as a result of city tree improvement work. In addition, and perhaps of more importance, the tree ordinances impose penalties for certain acts detrimental to the welfare of the trees and define those acts without chance of misunderstanding.

A sample set of ordinances covering the above points is as follows:

1. The board of (*insert name*) shall have full power and authority over all trees planted and to be planted in any of the streets or public places of the city, including the right to plant new trees and to care for the same, and to remove trees, living or dead, and to trim, spray and otherwise care for such trees.

2. The board of (*insert name*) is authorized to appoint a city forester and such other employes and assistants as may be necessary, and to prescribe and define their respective duties and to fix the amount of their compensation. Such forester shall be an expert, trained in the care and culture of trees.

3. The board of (*insert name*) shall recommend to the (*insert name of civic legislative body*) from time to time, ordinances to be enacted by the said (*insert name of civic legislative body*) for the planting, care and protection of trees in the streets and public places of the city; but no such ordinance not recommended by the said board shall be enacted by the (*insert name of civic legislative body*). Nor shall any ordinance enacted pursuant hereto be altered or repealed without the recommendation of said board.

4. The (*insert name of civic legislative body*) shall every year grant to the board of (*insert name*) such sum of money as it shall require and as to the said (*insert name of civic legislative body*) shall appear reasonable and just, for the planting, maintaining and caring for the trees of the city, for purchasing or raising new trees, and for other expenses contemplated by Sections 1, 2, 3 and 4 of this act.

5. No person shall, without the written permit of the board of (*insert name*) cut, remove, plant, break or injure any tree, plant or shrub in any of the streets or public places of the city of (*insert name*). Nor shall any person injure, misuse, or remove any device placed and intended to protect any tree, plant or shrub in any part of the streets or public places of the city of (*insert name*). Nor shall any person fasten a horse to any tree, plant or shrub, or to any device intended to protect the same, or place a post for the hitching of horses within five feet of any tree, plant or shrub in any of the streets or public places of the city of (*insert name*).

6. No building material or any other material of any description shall be piled up against any street tree unless said tree is first sufficiently protected by a proper guard to prevent possible injury, and all instructions issued for that purpose by the board of (*insert name*) must be promptly complied with by the owner.

7. The board of (*insert name*) shall have power to remove any wire conduit or other thing that burns, cuts or chafes any part of any tree, whether trunk, root or branch, in any street or public place, in case the owner of the wire shall fail after three days written notice to take adequate steps to prevent further injury.

8. No paving of any description shall be laid or maintained by anyone between the sidewalk and the curb which shall cut off the air and water from any tree.

Other sections of the ordinances defining the size and kind of trees for planting and the method of setting out may be included and worded so as to conform to local conditions.

WORK OF STATE FORESTER IN PLANTING.

The State Forester has established nurseries on several of the twelve sub-experiment stations, which are located in different sections of the State, where a wide variety of tree species native to the United States and abroad are being grown for experimental and demonstration purposes. This stock will be planted out where it may be observed and the species adaptable for planting in this State determined. Surplus stock will be distributed for further testing and observation. State nurseries may later be the medium for the distribution of stock on a far wider scale than is at present contemplated. There is much to be learned as to the species most suitable for planting in Texas and publications on this subject will be issued from time to time. This Department will, as far as possible, furnish information and advise to cities, towns, schools and interested individuals on the planting and care of trees.